

Fratti 12-19

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): Fratti et al.
Case: 12-19
Serial No.: 10/628,941
Filing Date: July 29, 2003
Group: 2811
Examiner: Thomas J. Magee

I hereby certify that this paper is being deposited on this date with the U.S. Postal Service as first class mail addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Signature: Gene M. Mason Date: April 20, 2006

Title: Techniques for Curvature Control in Power Transistor Devices

TRANSMITTAL OF REPLY BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith are the following documents relating to the above-identified patent application:

(1) Reply Brief.

In the event of non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Deposit Account No. 50-0762** as required to correct the error. A duplicate copy of this letter is enclosed.

Respectfully,

Kevin M. Mason

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Date: April 20, 2006



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Fratti 12-19

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Patent Application

Applicant(s): Fratti et al.
Case: Fratti 12-19
Serial No.: 10/628,941
Filing Date: July 29, 2003
Group: 2811
Examiner: Ori Nadav

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Signature: Gen. Maurice Date: April 20, 2006

Title: Techniques for Curvature Control in Power Transistor Devices

REPLY BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants hereby reply to the Examiner's Answer, mailed February 23, 2006 (referred to hereinafter as "the Examiner's Answer"), in an Appeal of the final rejection of claims 1-16 in the above-identified patent application.

REAL PARTY IN INTEREST

A statement identifying the real party in interest is contained in Appellants' Appeal Brief.

RELATED APPEALS AND INTERFERENCES

A statement identifying related appeals is contained in Appellants' Appeal Brief.

STATUS OF CLAIMS

5 A statement identifying the status of the claims is contained in Appellants' Supplemental Appeal Brief.

STATUS OF AMENDMENTS

10 There have been no amendments to the claims filed subsequent to the appealed rejections.

SUMMARY OF CLAIMED SUBJECT MATTER

A Summary of the Invention is contained in Appellants' Appeal Brief.

15 STATEMENT OF GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A statement identifying the original grounds of rejection presented for review is contained in Appellants' Appeal Brief. Claims 1-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,091,121 issued to Oda, in view of S. Savastiouk et al., "Atmospheric Downstream Plasma," (hereinafter "Savastiouk") and U.S. Patent 6,559,011 issued to Shibib.

CLAIMS APPEALED

A copy of the appealed claims is contained in an Appendix of Appellants' Appeal Brief.

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ARGUMENT

In order to establish a *prima facie* case of obviousness, the following three criteria must be met:

[f]irst, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

M.P.E.P. §2143. Appellants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness for at least the reason that there exists no motivation to combine the references, and further, even if combinable, the references collectively do not teach each and every limitation of the independent claims.

Independent Claims 1, 13 and 16

Independent claims 1, 13, and 16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Oda, in view of Savastiouk and Shibib. In the Examiner's Answer, the Examiner asserts that "it appears that any semiconductor device having a dielectric film formed e.g. of silicon nitride, and inherently having a tensile stress, can be called 'stress compensation layer,' and when formed on a 'device film,' will inherently produce a tensile stress sufficient to counterbalance at least a portion of an overall residual stress of the device." The Examiner further asserts that "thinning Oda's device would inherently result in a device having an overall residual stress attributable at least in part to the thinning step."

The combined teachings of Oda with those of Savastiouk and Shibib do **not** teach or suggest a ***stress compensation layer*** with a tensile stress sufficient to counterbalance at least a portion of an ***overall residual stress*** of a power transistor device, a limitation present in each of independent claims 1, 13 and 16.

The present specification teaches that "the ***residual stress of DMOS film 102 that exceeds the tensile stress of substrate 104*** causes substantial concave curvature of DMOS device 100, as exemplified by the radius of curvature R." (Page 4, line 10-12; emphasis added.) The present specification further teaches that

*the stress of DMOS film 102 less the stress of substrate 104, that dictates the curvature of DMOS device 100, represents an **overall stress** in DMOS device 100. Thus, after aggressive backside substrate removal processing, the **overall***

5 *residual stress* of DMOS device 100 is a compressive stress that provides DMOS device 100 with a substantial concave curvature. This overall residual stress must be counterbalanced, at least in part, to reverse, substantially eliminate, or prevent further curvature of DMOS device 100. As such, the more of substrate 104 that is removed during aggressive backside substrate removal processing, the greater the overall residual stress of DMOS device 100.

(Page 8, lines 24-31; emphasis added.)

10 Furthermore, a “***stress compensation layer***” is defined in the present disclosure as being “intended to include one or more thin films or other material layers applied to a device film in order to *counterbalance at least a portion of an overall residual stress of a device.*” (Page 9, lines 8-10; emphasis added.)

15 Although a dielectric film may inherently have a tensile stress, it does not necessarily have a tensile stress sufficient to counterbalance at least a portion of an ***overall residual stress*** of the device. Thus, contrary to the Examiner’s assertion, any semiconductor device having a dielectric film formed that inherently has a tensile stress *cannot necessarily* be called a “***stress compensation layer.***” Regardless of whether Oda, Savastiouk, or Shibib disclose or suggest a dielectric film, Oda, Savastiouk, and Shibib, alone or in combination, do not disclose or suggest a “stress compensation layer,” as defined in the present disclosure, and do not disclose or suggest a stress compensation layer having a tensile stress sufficient to
20 counterbalance at least a portion of an ***overall residual stress*** of the device.

25 Specifically, nothing in the combined teachings of the references in any way indicates that the layers 12, 15, 17 of Oda would have a tensile stress *sufficient to counterbalance* any amount of ***overall residual stress*** resulting from substrate thinning. Layers 12, 15, 17 of Oda are protecting nitride films. While Oda teaches a protecting insulator film having a compressive stress for relaxing a tensile stress of the protecting nitride film (see, e.g., Abstract), there is no suggestion that the tensile stress is *sufficient to counterbalance* any amount of ***overall residual stress*** resulting from substrate thinning. *In fact, it appears from the limited teachings of Oda that the protecting insulator film is merely present to compensate for stresses inherent in layers adjacent thereto.*

In addition, Applicants respectfully disagree with the Examiner's assertions for at least the reason that there exists no motivation to combine the teachings of Oda with those of Savastiouk and Shibib, to come up with the limitations of the present invention. For example, with regard to the proposed combination of Oda and Savastiouk, the Examiner found it obvious to use the procedures of Savastiouk in Oda "to thin the substrate in Oda's device." See, Office Action, page 4. Applicants disagree and respectfully submit that one of ordinary skill in the art would not be motivated to supplement the teachings of Oda with those of Savastiouk to thin the substrate in Oda's device, as the Examiner suggests.

Claims 7 and 11-12

With regard to claim 7, this claim specifies that the steps (e.g., of claim 1) of thinning the substrate and applying a stress compensation layer are *performed repeatedly* until a *desired curvature is attained*. Appellants respectfully submit that the teachings of the cited references, even if combinable, do not teach or suggest this limitation.

In the Office Action dated September 2, 2005, page 4, the Examiner stated that it would have been obvious to "monitor the curvature of the device by using an off-axis optical laser technique and to repeat the steps of thinning and applying until a desired curvature is attained." Appellants respectfully submit that these statements by the Examiner are incorrect. The cited references do not disclose that thinning of the substrate would produce a curvature of the device as the Examiner contends. Appellants could also find no disclosure or suggestion in Oda, Savastiouk, or Shibib to *repeatedly perform* the thinning of the substrate and the application of a stress compensation layer until a *desired curvature is attained*.

Claims 9 and 10

Claim 9 specifies that the ***stress compensation layer*** applied to the surface of the device changes the curvature of the device. Claim 10 specifies that the ***stress compensation layer*** applied to the surface of the device maintains the curvature of the device. The Examiner asserts that this is inherent in the prior art device. While Oda may teach a protecting insulator

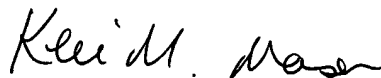
film having a compressive stress for relaxing a tensile stress of the protecting nitride film, there is no suggestion that a *stress compensation layer, as defined in the present specification*, applied to the surface of the device changes or maintains the *curvature* of the device.

5 Conclusion

The rejections of the cited claims under section 103 in view of Oda, Savastiouk, and Shibib, alone or in any combination, are therefore believed to be improper and should be withdrawn. The remaining rejected dependent claims are believed allowable for at least the reasons identified above with respect to the independent claims.

10 The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,



15 Date: April 20, 2006

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EVIDENCE APPENDIX

There is no evidence submitted pursuant to § 1.130, 1.131, or 1.132 or entered by the Examiner and relied upon by appellant.

RELATED PROCEEDINGS APPENDIX

There are no known decisions rendered by a court or the Board in any proceeding identified pursuant to paragraph (c)(1)(ii) of 37 CFR 41.37.